DOCUMENT 3

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CLAIMS

[Claim(s)]

[Claim 1]A reverse face protective sheet for solar cells more than density 0.94 (g/cm^3) consisting of a sheet provided with weatherability and dampproofing using polyethylene system resin below 0.97 (g/cm^3).

[Claim 2]The reverse face protective sheet for solar cells according to claim 1 as for which more than density 0.94 (g/cm^3) becomes polyethylene system resin below 0.97 (g/cm^3) from a compound which added at least one sort in a tabular bulking agent, an ultraviolet shielding agent and an antioxidant, or an ultraviolet ray absorbent.

[Claim 3]A reverse face protective sheet for solar cells which laminates the sheet comrade according to claim 1 or 2 on both sides of a thermoplastic polyester resin film.

[Claim 4]A sheet as for which more than density 0.94 (g/cm^3) becomes polyethylene system resin below 0.97 (g/cm^3) from a compound which added a tabular bulking agent, A reverse face protective sheet for solar cells laminating a sheet which becomes the above-mentioned polyethylene system resin from a compound which added at least one sort in an ultraviolet shielding agent, an antioxidant, or an ultraviolet ray absorbent.

[Claim 5]A reverse face protective sheet for solar cells inserting a thermoplastic polyester resin film in the middle of a lamination layer sheet of claim 4.

[Claim 6]A reverse face protective sheet for solar cells in which a sheet provided with weatherability and high dampproofing is characterized by a bridge being constructed over a gel fraction by range which becomes 10 to 80% by either claim 1 thru/or claim 5.

[Claim 7]A solar cell and a solar cell module using the sheet according to claim 1 to 6.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the cheap and high reverse face protective sheet for solar cells of environment-resistant ability, and the solar cell and solar cell module using it.
[0002]
[Description of the Prior Art]In order to raise the environment-resistant ability which does not deteriorate easily under a mechanical strength or an environmental atmosphere in the case of the solar cell module used outdoors and to secure reliability, the structure which uses a synthetic resin and encloses a solar cell on a tempered glass board or a metal substrate is generally used. When the modular structure by a laminating method is explained more concretely, on a tempered glass board An ethylene-vinyl acetate copolymer. (It is hereafter called "EVA") The thing of the structure which laminated and carried out heat crimping of a sheet, solar ****, an EVA sheet, and the sheet (henceforth an "aluminum fluoride composite sheet") constituted from a fluoridation vinyl sheet on both sides of aluminium foil to this order is used. The terminal box for power supply drawing is being fixed to the aluminum fluoride composite sheet surface from silicone series sealant.
[0003]When a solar cell is a thin film solar cell like an amorphous silicon, a solar cell is directly formed on a tempered glass board, and what laminated and carried out heat crimping of an EVA sheet and the aluminum fluoride composite sheet on this is used.
[0004]
[Problem(s) to be Solved by the Invention]In such a conventional structure, since the aluminum fluoride composite sheet is used, modular reliability has highly the outstanding feature that productivity is very high. However, since this aluminum fluoride composite sheet was expensive, there was a problem of becoming what has an expensive module price. When the aluminum fluoride composite sheet was used, there was also a problem of being easy to cause a short circuit between a solar battery element and the aluminium foil of a composite sheet.
[0005]
[Means for Solving the Problem]this invention being able to solve a problem of the above-mentioned conventional technology, making it cheap, and providing a reverse face protective sheet for solar cells whose high reliability and productivity are also very high, and, A place which provides a solar cell and a solar cell module using this reverse face protective sheet, and is made into that gist, More than density 0.94 (g/cm^3) is in a solar cell and a solar cell module using a reverse face protective sheet for solar cells consisting of a sheet provided with weatherability and dampproofing using polyethylene system resin below 0.97 (g/cm^3), and this sheet.
[0006]
[Embodiment of the Invention]Hereafter, this invention is explained in detail. The reverse face protective sheet for solar cells of this invention consists of a sheet provided with weatherability and high dampproofing, and when this sheet is laminated by the rear face of a solar cell or a solar cell module, a solar battery element will be closed with a reverse face protective sheet. Thereby, as well as permeation of storm sewage, a solar battery element is intercepted also from permeation of the water vapor of the air, and is protected from moisture.

[0007]It is protected also from the evil by steam permeation caused by one side following the roof of the outdoor structure in which it enters from the surface side through the part where a solar battery element is not arranged, or the solar cell is installed, the sunlight to which it shines conversely and is contrary from building materials, and degradation of a reverse face protective sheet and it by a snowstorm. Since the metallic foil is not used like the further conventional aluminum fluoride composite sheet, a short circuit with a solar battery element is not produced, either.

[0008]The sheet provided with the weatherability of this invention, and high dampproofing More than density 0.94 (g/cm^3). It is a sheet which consists of polyethylene system resin below 0.97 (g/cm^3), and since it excels in the structure top weatherability of resin and an EVA sheet and structure are similar, especially the sheet that consists of this polyethylene system resin is excellent also in the adhesive property with an EVA sheet.

[0009]Since the ranges of the density of polyethylene system resin are 0.94-0.97 (g/cm^3), dampproofing is good, effective interception and the prevention from invasion of a steam can be performed, and a solar cell or a solar cell module excellent in weatherability and dampproofing becomes possible. Since the melting point is high, it can contribute to the improvement in heat-resistant of a reverse face protective sheet, and polyethylene system resin of the above-mentioned density range can show sufficient tolerance to the thermal load at the time of processing of a solar cell or a solar cell module or use. It is general-purpose resin to use the above-mentioned polyethylene system resin, and there is an advantage that it is cheap in respect of a price.

[0010]Although an ethylene independent polymer may be sufficient, polyethylene system resin is a range which does not spoil the above-mentioned characteristic, and even if it is a copolymer with other monomers, it is not cared about. For example, it is also possible to strengthen more an adhesive property with an EVA sheet or silicon sealant using the polyethylene which carried out graft polymerization to the maleic anhydride. The ranges of 0.01 mm - 1.0 mm of the thickness of the sheet which consists of polyethylene system resin are weatherability, dampproofing and molding processability, a solar cell or the lamination processability to a solar cell module, and a still more suitable range from the field of a price. The sheet which consists of polyethylene system resin can carry out a fabricating operation to a sheet by the method generally known, and forming processes, such as calender molding, extrusion molding, and press forming, are specifically preferred for it.

[0011]In order that the sheet which consists of the above-mentioned polyethylene system resin may improve the reliability of the performance more, what added the tabular bulking agent, the ultraviolet shielding agent, and the ultraviolet ray absorbent is contained in this invention.

[0012]It can distribute in resin and the tabular bulking agent can secure more effective dampproofing. Although the reason for a dampproof improvement is not certain, it thinks for a bulking agent to carry out distributed orientation and to form an effective steam block almost in parallel, to the surface of a sheet. Addition of the above-mentioned tabular bulking agent can raise heat resistance more. As heat resistance, the heat resistance in the working temperature of 120-150 ** at the time of the fabricating operation of a solar cell or a solar cell module, and the temperature in the case of being used under blazing heat and the heat resistance at about 80 ** are required, and both heat resistance can be improved by addition of a tabular bulking agent.

[0013]As a tabular bulking agent, talc, mica, calcium carbonate, a sericite, black lead, aluminium hydroxide, iron oxide, various metallic foils, etc. are specifically mentioned, and two or more sorts may be mixed.

[0014]Although the mean particle diameter of the tabular bulking agent with which it is filled up is influenced by the thickness of a sheet, When the range of 10-300 micrometers is preferred and is less than 10 micrometers, there are few dampproof improvement effects, when 300 micrometers is exceeded, the distributed maintenance effect to the inside of the sheet of a bulking agent is low, and since a crack is further produced on a sheet, a protecting effect becomes low similarly. As for the addition of a tabular bulking agent, 40 or less % of the weight is

desirable to polyethylene system resin. Although an effect goes up dampproofing in proportion to increase of an addition, if the quantity of a bulking agent increases, a mechanical strength not only falls, but it will be easy to produce the evil of the maldistribution to resin of a bulking agent, the heavy load to sheet processing equipment, etc.

[0015]It distributes in resin and each of ultraviolet shielding agents, antioxidants, and ultraviolet ray absorbents demonstrates more effective weatherability. As an ultraviolet shielding agent, although titanium oxide, a zinc oxide, and carbon black are typical, since there is little coloring according [titanium oxide of a rutile type crystal structure] to weather resistance deterioration practical, it is desirable. Since it is because that titanium oxide improves weatherability mainly covers ultraviolet rays, 3 to 20 % of the weight of an addition is desirable. It is because less than 3 % of the weight is insufficient as for the effect of a screen factor, and improvement of a shielding effect will decrease if 20 % of the weight is exceeded.

[0016]As an antioxidant and an ultraviolet ray absorbent, that by which normal use is generally carried out to the plastic sheet and the film can be used, and there are a phenol derivative, an allylamine derivative, phosphite, etc. as an antioxidant. As an ultraviolet ray absorbent, a benzophenone derivative, salicylate, benzotriazole derivatives, a piperidine derivative, a benzoate derivative, a tin organic compound, thiazolidone, etc. are typical.

[0017]The protective sheet of this invention can use the lamination layer sheet which consists of two or more layers using the above-mentioned polyethylene-system-resin sheet, and two kinds of things which consist of the next composition as a lamination layer sheet can use it conveniently. The sheet which adds a tabular bulking agent to polyethylene system resin (1): A inner layer (solar cell side). It is the composition which made the sheet which adds at least one sort in an ultraviolet shielding agent effective for weatherability, an antioxidant, or an ultraviolet ray absorbent polyethylene system resin with the outer layer, and is the same as that of the above about contents and an operation.

After obtaining the sheet of (1) by calender molding, extrusion molding, press forming, etc. independently, it is processible by the method of laminating simultaneously by a co-extrusion besides the method of laminating by the laminating method and the pressing method by a hot calender roll.

[0018](2): It is the composition of the above (1) and effective dampproofing and heat resistance can be secured by the polyethylene terephthalate layer with the composition which laminated the polyethylene terephthalate layer as an interlayer further. About the contents of other composition, it is the same as that of the above. The lamination layer sheet of (2) is processible by the same method as (1), after sheet-izing beforehand polyethylene terephthalate and the layer which adjoins it.

[0019]In the protective sheet of this invention, what constructed the bridge can use each sheet of the composition to **** conveniently further, and more effective heat resistance and an adhesive property can be secured by introducing bridge construction. 10 to 80% of range of a degree of cross linking is preferred at a gel fraction, and there is no bridge construction effect, if 80% is exceeded, the bridge construction effect will become saturation, and also at less than 10%, it is easy to spoil an adhesive property. It asks for a gel fraction with the insoluble solution weight fraction (%) after making a sheet immersed in 180 ** toluene for 7 hours.

[0020]As a crosslinking method, what carried out Silang denaturation of some polyethylene system resin is fabricated on a sheet. After carrying out lamination processing, add a peroxide to the Silang bridge construction and polyethylene system resin which are made to construct a bridge according to condensation under high-humidity/temperature, and it fabricates on a sheet. After carrying out shaping lamination processing of the sheet of the composition to the peroxide bridge construction made to construct a bridge by a radical reaction at an elevated temperature after laminating, and ****, it can obtain by the ability to construct a bridge by methods, such as radiation-induced crosslinking which irradiate with radiation (X-rays, a gamma ray, a beta ray, an electron beam, etc.) and over which it is made to construct a bridge.

[0021]If in charge of bridge construction, it is also possible to add [cross linking agent / which have two or more functional groups about crosslinking reaction for adjustment of bridge construction efficiency]. Crosslinking reaction is changed to the thickness direction of a sheet

in inclination by using the penetrable low electron beam of radiation about radiation-induced crosslinking. The degree of oxidation reaction by the oxidation reaction which occurs in parallel with a degree of cross linking and crosslinking reaction in the reverse side and the table of a sheet can be changed, and heat resistance and an adhesive property can be adjusted.

[0022]The sheet provided with the weatherability of the contents mentioned above, and high dampproofing, Although there is no necessity of providing an adhesive resin layer anew adjacently from having an adhesive property with an EVA sheet in itself, in order to improve adhesive reliability, The adhesive resin layer which consists of polyethylene system resin etc. is provided, and also surface treatments, such as corona treatment and ozonization, may be carried out to each field by the side of an adhesion side with an EVA sheet, or an adhesion side with a terminal box.

[0023]Although the reverse face protective sheet of this invention was explained, the solar cell which closed this **** rear-face side for back sheets next is explained. Usually, while a solar cell laminates the transparent electrode and amorphous silicon system semiconductor which consist of a transparent electric conduction thin film, and a metal electrode in predetermined shape and forms two or more solar battery elements on the glass substrate which consists of tempered glass, It is constituted so that the voltage and current which connect in series or in parallel and need this solar battery element if needed may be acquired.

[0024]In order to protect a solar battery element, the above-mentioned reverse face protective sheet is allocated in the field by the side of a solar battery element, and the heating bond of this solar cell is carried out. The solar battery element is covered with the protective sheet of this invention which uses as the main ingredients the polyethylene system resin in which the solar cell closed with the reverse face protective sheet was provided with weatherability and high dampproofing. Therefore, a solar battery element has the outstanding waterproof steamy permeability, and can aim at maintenance reservation of the characteristic. The heating bond of the reverse face protective sheet which consists of the same sheet as the above-mentioned may be carried out to the solar battery element side concerning the same composition as the above-mentioned using the vacuum laminating method with an EVA sheet.

[0025]Although the solar battery element which used the amorphous silicon system semiconductor layer was explained to the example above below, the solar battery element in this invention may be a thing of a crystal system. Namely, form a metal electrode in other one side, and a solar battery element is constituted while it forms a transparent electrode in one side of the semiconductor layer produced from the wafer of the silicon single crystal,Two or more solar battery elements are connected in series and in parallel by wire bonding, and the solar cell is constituted so that predetermined current and voltage may be outputted.

[0026]This solar cell is laminated in order of tempered glass / EVA sheet/, and a solar cell / EVA sheet / reverse face protective sheet, and a heating bond is carried out using the vacuum laminating method, and it is closed between tempered glass and a reverse face protective sheet. The reverse face protective sheet can secure high dampproofing with weatherability like the above-mentioned.

[0027]Although many things were explained about this invention above, this invention can also be carried out combining various above-mentioned examples that it cannot be overemphasized that it is not what is limited to the example used for explanation.

[0028]Hereafter, an example explains this invention in detail.

[0029]

[Example][Example 1] Polyethylene resin (the 0.20-mm-thick sheet was extruded for density 0.952 (g/cm^3) and the melt flow rate 0.55 (g / 10 minutes) from the cap with a temperature of 210 ** using the extrusion machine, and this was made into the reverse face protective sheet for solar cells.) Weatherability, dampproofing, and heat resistance were evaluated using this sheet, and that result was shown in Table 1. The valuation method of each characteristic is as follows.

[0030](Weatherability) In the size of 50 mm x 150 mm, on a 3-mm-thick glass plate, It piled up in the same size in order of the 0.4-mm-thick EVA sheet and the reverse face protective sheet for

solar cells, and at the temperature of 100 **, heat pressing was carried out, temporary adhesion was carried out, it was neglected in 150 ** oven for 1 hour, adhesion (bridge construction of an EVA sheet) was completed, and the sample for evaluation equivalent to a solar cell was obtained. After carrying out promotion degradation of this by [as the reverse face protective sheet for solar cells turning to the light source side] with a sunshine weather meter for 500 hours, tactile feeling viewed and estimated the state of the sample by the following four-step evaluations, and the result was shown in Table 1.

[0031]

O — A color, appearance, and adhesion completely have no change.

O — Change is slightly looked at by a color, appearance, and adhesion, and practicality is not spoiled.

** — Change is looked at by a color, appearance, and adhesion and practicality is spoiled selectively.

x — A color, appearance, and adhesion change considerably and do not bear practical use.

[0032](Dampproofing) Moisture vapor transmission was measured for the reverse face protective sheet for solar cells itself by JISK7129 under 40 ** and 90% (relative humidity), and the following four-step evaluations were performed.

O — Moisture vapor transmission is less than 1(g/m^2 and 24 hr**atm**0.1mm)O. — Moisture vapor transmission is 1-2 (**).

** — moisture vapor transmission — 2.1-5 (**)

x — That in which moisture vapor transmission exceeds 5 (**).

[0033](Heat resistance) It piled up in the size same on a 3-mm-thick glass plate with the size of 50 mm x 150 mm in order of the 0.4-mm-thick EVA sheet and the solar cell reverse face protective sheet, and at the temperature of 100 **, heat pressing was carried out, temporary adhesion was carried out, and the sample for evaluation corresponding just before the working completion of a solar cell was obtained. The state of the reverse face protective sheet for solar cells immediately after neglecting this, maintaining this direction in 150 ** oven for 1 hour was observed by viewing, and the following four-step evaluations were performed.

O — Bending of a dimensional change and an end is not seen at all.

O — There is no dimensional change and practicality is not spoiled by the grade by which an end is bent slightly.

** — Bending of a dimensional change and an end is seen and practicality is spoiled selectively.

x — a size changes a lot and practicality to the polyethylene resin 100 same weight section as [Example 2] example 1 spoiled. 40 weight sections, titanium oxide 10 rutile type weight section, piperidine series ultraviolet ray absorbent 0.5 weight section, and phenolic antioxidant 0.1 weight section were mixed, mica with a mean particle diameter of 30 micrometers was fabricated in thickness of 0.15 mm using the extrusion machine, and the reverse face protective sheet for solar cells was obtained. The same evaluation as Example 1 was performed using this sheet, and that result was shown in Table 1.

[0034][Example 3] What mixed 40 weight sections of mica with a mean particle diameter of 30 micrometers to the polyethylene resin 100 same weight section as Example 1, and was fabricated in thickness of 0.10 mm at it using the extrusion machine. To the polyethylene resin 100 same weight section as Example 1, titanium oxide 10 rutile type weight section, Piperidine series ultraviolet ray absorbent 0.5 weight section and phenolic antioxidant 0.1 weight section were mixed, laminate molding of what was fabricated in thickness of 0.05 mm was carried out at 180 ** by the pressing method using the extrusion machine, and the reverse face protective sheet for solar cells which made the inner layer the sheet which mixed mica was obtained. The same evaluation as Example 1 was performed using this sheet, and that result was shown in Table 1.

[0035][Example 4] The same polyethylene resin as Example 1 is fabricated in thickness of 0.06 mm like Example 1, In piles, by the heat pressing method, laminate molding was carried out at 180 ** to both sides of the polyethylene terephthalate film (38 micrometers in thickness) which carried out the anchor coat of the prepared polyurethane resin beforehand, and the reverse face

protective sheet for solar cells was obtained to them. The same evaluation test as Example 1 was done using this sheet, and that result was shown in Table 1.

[0036][Example 5] Using the same sheet as Example 1, from one side [further], 30Mrad exposure of the electron beam was carried out by accelerating voltage 150kv, and the bridge was constructed over 44% of the gel fraction. The reverse face protective sheet for solar cells which made the non-irradiation surface the inner layer was obtained. Using this sheet, the same evaluation as Example 1 was performed, and that result was shown in Table 1.

[0037][Comparative example 1] Polyethylene resin (density 0.923 (g/cm^3) and the melt flow rate 0.3 (g / 10 minutes) were fabricated in thickness of 0.20 mm from the cap (temperature of 200 **) using the extrusion machine, and the reverse face protective sheet for solar cells was obtained.) The same evaluation as Example 1 was performed using this sheet, and that result was shown in Table 1.

[0038][Comparative example 2] Using the aluminum fluoride composite sheet (0.08 mm in thickness) constituted from a fluoridation vinyl sheet on both sides of aluminium foil, the same evaluation as Example 1 was performed, and the result was shown in Table 1.

[0039]

[Table 1]

表1

	耐候性	防湿性	耐熱性	価 格	総合評価
実施例1	○	○	○	◎	○
実施例2	◎	◎	○～◎	◎	◎
実施例3	◎	◎	○～◎	◎	◎
実施例4	○	○	◎	○	○
実施例5	○	○	◎	○	○
比較例1	○	×	×	◎	×
比較例2	◎	◎	◎	×	△

[0040]About Example 1 thru/or Example 5 which is a reverse face protective sheet for solar cells of this invention, Table 1 shows excelling also about which evaluation criteria. On the other hand, it turns out that it is inferior to dampproofing and heat resistance about the comparative example 1 which uses too low-density polyethylene resin, and inferior in respect of a price in the comparative example 2 which uses the conventional aluminum fluoride composite sheet.

[0041]

[Effect of the Invention]As mentioned above, since the reverse face protective sheet for solar cells of this invention consists of composition which uses polyethylene system resin as the main ingredients, though it is cheap, it is excellent in environment-resistant ability.And since this reverse face protective sheet for solar cells can be fabricated and processed by a general-purpose method, it is suitable also for mass production, and the high solar cell and solar cell module of environment-resistant ability can be obtained.

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TECHNICAL FIELD

[Field of the Invention]This invention relates to the cheap and high reverse face protective sheet for solar cells of environment-resistant ability, and the solar cell and solar cell module using it.

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PRIOR ART

[Description of the Prior Art]In order to raise the environment-resistant ability which does not deteriorate easily under a mechanical strength or an environmental atmosphere in the case of the solar cell module used outdoors and to secure reliability, the structure which uses a synthetic resin and encloses a solar cell on a tempered glass board or a metal substrate is generally used. When the modular structure by a laminating method is explained more concretely, on a tempered glass board An ethylene-vinyl acetate copolymer. (It is hereafter called "EVA") The thing of the structure which laminated and carried out heat crimping of a sheet, solar ****, an EVA sheet, and the sheet (henceforth an "aluminum fluoride composite sheet") constituted from a fluoridation vinyl sheet on both sides of aluminium foil to this order is used. The terminal box for power supply drawing is being fixed to the aluminum fluoride composite sheet surface from silicone series sealant.
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EFFECT OF THE INVENTION

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]In such a conventional structure, since the aluminum fluoride composite sheet is used, modular reliability has highly the outstanding feature that productivity is very high. However, since this aluminum fluoride composite sheet was expensive, there was a problem of becoming what has an expensive module price. When the aluminum fluoride composite sheet was used, there was also a problem of being easy to cause a short circuit between a solar battery element and the aluminium foil of a composite sheet.

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MEANS

[Means for Solving the Problem]this invention being able to solve a problem of the above-mentioned conventional technology, making it cheap, and providing a reverse face protective sheet for solar cells whose high reliability and productivity are also very high, and, A place which provides a solar cell and a solar cell module using this reverse face protective sheet, and is made into that gist, More than density 0.94 (g/cm^3) is in a solar cell and a solar cell module using a reverse face protective sheet for solar cells consisting of a sheet provided with weatherability and dampproofing using polyethylene system resin below 0.97 (g/cm^3), and this sheet.
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[0007]It is protected also from the evil by steam permeation caused by one side following the roof of the outdoor structure in which it enters from the surface side through the part where a solar battery element is not arranged, or the solar cell is installed, the sunlight to which it shines conversely and is contrary from building materials, and degradation of a reverse face protective sheet and it by a snowstorm. Since the metallic foil is not used like the further conventional aluminum fluoride composite sheet, a short circuit with a solar battery element is not produced, either.
[0008]The sheet provided with the weatherability of this invention, and high dampproofing More than density 0.94 (g/cm^3). It is a sheet which consists of polyethylene system resin below 0.97 (g/cm^3), and since it excels in the structure top weatherability of resin and an EVA sheet and structure are similar, especially the sheet that consists of this polyethylene system resin is excellent also in the adhesive property with an EVA sheet.
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thickness of the sheet which consists of polyethylene system resin are weatherability, dampproofing and molding processability, a solar cell or the lamination processability to a solar cell module, and a still more suitable range from the field of a price. The sheet which consists of polyethylene system resin can carry out a fabricating operation to a sheet by the method generally known, and forming processes, such as calender molding, extrusion molding, and press forming, are specifically preferred for it.

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[0015]It distributes in resin and each of ultraviolet shielding agents, antioxidants, and ultraviolet ray absorbents demonstrates more effective weatherability. As an ultraviolet shielding agent, although titanium oxide, a zinc oxide, and carbon black are typical, since there is little coloring according [titanium oxide of a rutile type crystal structure] to weather resistance deterioration practical, it is desirable. Since it is because that titanium oxide improves weatherability mainly covers ultraviolet rays, 3 to 20 % of the weight of an addition is desirable. It is because less than 3 % of the weight is insufficient as for the effect of a screen factor, and improvement of a shielding effect will decrease if 20 % of the weight is exceeded.

[0016]As an antioxidant and an ultraviolet ray absorbent, that by which normal use is generally carried out to the plastic sheet and the film can be used, and there are a phenol derivative, an allylamine derivative, phosphite, etc. as an antioxidant. As an ultraviolet ray absorbent, a benzophenone derivative, salicylate, benzotriazole derivatives, a piperidine derivative, a benzoate derivative, a tin organic compound, thiazolidone, etc. are typical.

[0017]The protective sheet of this invention can use the lamination layer sheet which consists of two or more layers using the above-mentioned polyethylene-system-resin sheet, and two kinds of things which consist of the next composition as a lamination layer sheet can use it conveniently. The sheet which adds a tabular bulking agent to polyethylene system resin (1): A inner layer (solar cell side), It is the composition which made the sheet which adds at least one sort in an ultraviolet shielding agent effective for weatherability, an antioxidant, or an ultraviolet ray absorbent polyethylene system resin with the outer layer, and is the same as that of the above about contents and an operation.

After obtaining the sheet of (1) by calender molding, extrusion molding, press forming, etc. independently, it is processible by the method of laminating simultaneously by a co-extrusion

besides the method of laminating by the laminating method and the pressing method by a hot calender roll.

[0018](2): It is the composition of the above (1) and effective dampproofing and heat resistance can be secured by the polyethylene terephthalate layer with the composition which laminated the polyethylene terephthalate layer as an interlayer further. About the contents of other composition, it is the same as that of the above. The lamination layer sheet of (2) is processible by the same method as (1), after sheet-izing beforehand polyethylene terephthalate and the layer which adjoins it.

[0019]In the protective sheet of this invention, what constructed the bridge can use each sheet of the composition to **** conveniently further, and more effective heat resistance and an adhesive property can be secured by introducing bridge construction. 10 to 80% of range of a degree of cross linking is preferred at a gel fraction, and there is no bridge construction effect, if 80% is exceeded, the bridge construction effect will become saturation, and also at less than 10%, it is easy to spoil an adhesive property. It asks for a gel fraction with the insoluble solution weight fraction (%) after making a sheet immersed in 180 ** toluene for 7 hours.

[0020]As a crosslinking method, what carried out Silang denaturation of some polyethylene system resin is fabricated on a sheet. After carrying out lamination processing, add a peroxide to the Silang bridge construction and polyethylene system resin which are made to construct a bridge according to condensation under high-humidity/temperature, and it fabricates on a sheet. After carrying out shaping lamination processing of the sheet of the composition to the peroxide bridge construction made to construct a bridge by a radical reaction at an elevated temperature after laminating, and ****, it can obtain by the ability to construct a bridge by methods, such as radiation-induced crosslinking which irradiate with radiation (X-rays, a gamma ray, a beta ray, an electron beam, etc.) and over which it is made to construct a bridge.

[0021]If in charge of bridge construction, it is also possible to add [cross linking agent / which have two or more functional groups about crosslinking reaction for adjustment of bridge construction efficiency]. Crosslinking reaction is changed to the thickness direction of a sheet in inclination by using the penetrable low electron beam of radiation about radiation-induced crosslinking. The degree of oxidation reaction by the oxidation reaction which occurs in parallel with a degree of cross linking and crosslinking reaction in the reverse side and the table of a sheet can be changed, and heat resistance and an adhesive property can be adjusted.

[0022]The sheet provided with the weatherability of the contents mentioned above, and high dampproofing. Although there is no necessity of providing an adhesive resin layer anew adjacently from having an adhesive property with an EVA sheet in itself, in order to improve adhesive reliability, The adhesive resin layer which consists of polyethylene system resin etc. is provided, and also surface treatments, such as corona treatment and ozonization, may be carried out to each field by the side of an adhesion side with an EVA sheet, or an adhesion side with a terminal box.

[0023]Although the reverse face protective sheet of this invention was explained, the solar cell which closed this **** rear-face side for back sheets next is explained. Usually, while a solar cell laminates the transparent electrode and amorphous silicon system semiconductor which consist of a transparent electric conduction thin film, and a metal electrode in predetermined shape and forms two or more solar battery elements on the glass substrate which consists of tempered glass, It is constituted so that the voltage and current which connect in series or in parallel and need this solar battery element if needed may be acquired.

[0024]In order to protect a solar battery element, the above-mentioned reverse face protective sheet is allocated in the field by the side of a solar battery element, and the heating bond of this solar cell is carried out. The solar battery element is covered with the protective sheet of this invention which uses as the main ingredients the polyethylene system resin in which the solar cell closed with the reverse face protective sheet was provided with weatherability and high dampproofing. Therefore, a solar battery element has the outstanding waterproof steamy permeability, and can aim at maintenance reservation of the characteristic. The heating bond of the reverse face protective sheet which consists of the same sheet as the above-mentioned may be carried out to the solar battery element side concerning the same composition as the

above-mentioned using the vacuum laminating method with an EVA sheet.
[0025]Although the solar battery element which used the amorphous silicon system semiconductor layer was explained to the example above below, the solar battery element in this invention may be a thing of a crystal system. Namely, form a metal electrode in other one side, and a solar battery element is constituted while it forms a transparent electrode in one side of the semiconductor layer produced from the wafer of the silicon single crystal,Two or more solar battery elements are connected in series and in parallel by wire bonding, and the solar cell is constituted so that predetermined current and voltage may be outputted.
[0026]This solar cell is laminated in order of tempered glass / EVA sheet/, and a solar cell / EVA sheet / reverse face protective sheet, and a heating bond is carried out using the vacuum laminating method, and it is closed between tempered glass and a reverse face protective sheet. The reverse face protective sheet can secure high dampproofing with weatherability like the above-mentioned.
[0027]Although many things were explained about this invention above, this invention can also be carried out combining various above-mentioned examples that it cannot be overemphasized that it is not what is limited to the example used for explanation.
[0028]Hereafter, an example explains this invention in detail.

[Translation done.]

EXAMPLE

[Example][Example 1] Polyethylene resin (the 0.20-mm-thick sheet was extruded for density 0.952 (g/cm^3) and the melt flow rate 0.55 (g / 10 minutes) from the cap with a temperature of 210 ** using the extrusion machine, and this was made into the reverse face protective sheet for solar cells.) Weatherability, dampproofing, and heat resistance were evaluated using this sheet, and that result was shown in Table 1. The valuation method of each characteristic is as follows.

[0030](Weatherability) In the size of 50 mm x 150 mm, on a 3-mm-thick glass plate, It piled up in the same size in order of the 0.4-mm-thick EVA sheet and the reverse face protective sheet for solar cells, and at the temperature of 100 **, heat pressing was carried out, temporary adhesion was carried out, it was neglected in 150 ** oven for 1 hour, adhesion (bridge construction of an EVA sheet) was completed, and the sample for evaluation equivalent to a solar cell was obtained. After carrying out promotion degradation of this by [as the reverse face protective sheet for solar cells turning to the light source side] with a sunshine weather meter for 500 hours, tactile feeling viewed and estimated the state of the sample by the following four-step evaluations, and the result was shown in Table 1.

[0031]

O — A color, appearance, and adhesion completely have no change.
O — Change is slightly looked at by a color, appearance, and adhesion, and practicality is not spoiled.
** — Change is looked at by a color, appearance, and adhesion and practicality is spoiled selectively.
x — A color, appearance, and adhesion change considerably and do not bear practical use.

[0032](Dampproofing) Moisture vapor transmission was measured for the reverse face protective sheet for solar cells itself by JISK7129 under 40 ** and 90% (relative humidity), and the following four-step evaluations were performed.

O — Moisture vapor transmission is less than 1(g/m^2 and 24 hr**atm**0.1mm)O. — Moisture vapor transmission is 1-2 (**).
** — moisture vapor transmission — 2.1-5 (**)
x — That in which moisture vapor transmission exceeds 5 (**).

[0033](Heat resistance) It piled up in the size same on a 3-mm-thick glass plate with the size of 50 mm x 150 mm in order of the 0.4-mm-thick EVA sheet and the solar cell reverse face protective sheet, and at the temperature of 100 **, heat pressing was carried out, temporary adhesion was carried out, and the sample for evaluation corresponding just before the working completion of a solar cell was obtained. The state of the reverse face protective sheet for solar cells immediately after neglecting this, maintaining this direction in 150 ** oven for 1 hour was observed by viewing, and the following four-step evaluations were performed.

O — Bending of a dimensional change and an end is not seen at all.
O — There is no dimensional change and practicality is not spoiled by the grade by which an end is bent slightly.
** — Bending of a dimensional change and an end is seen and practicality is spoiled selectively.
x — a size changes a lot and practicality to the polyethylene resin 100 same weight section as

[Example 2] example 1 spoiled. 40 weight sections, titanium oxide 10 rutile type weight section, piperidine series ultraviolet ray absorbent 0.5 weight section, and phenolic antioxidant 0.1 weight section were mixed, mica with a mean particle diameter of 30 micrometers was fabricated in thickness of 0.15 mm using the extrusion machine, and the reverse face protective sheet for solar cells was obtained. The same evaluation as Example 1 was performed using this sheet, and that result was shown in Table 1.

[0034][Example 3] What mixed 40 weight sections of mica with a mean particle diameter of 30 micrometers to the polyethylene resin 100 same weight section as Example 1, and was fabricated in thickness of 0.10 mm at it using the extrusion machine, To the polyethylene resin 100 same weight section as Example 1, titanium oxide 10 rutile type weight section,. Piperidine series ultraviolet ray absorbent 0.5 weight section and phenolic antioxidant 0.1 weight section were mixed, laminate molding of what was fabricated in thickness of 0.05 mm was carried out at 180 ** by the pressing method using the extrusion machine, and the reverse face protective sheet for solar cells which made the inner layer the sheet which mixed mica was obtained. The same evaluation as Example 1 was performed using this sheet, and that result was shown in Table 1.

[0035][Example 4] The same polyethylene resin as Example 1 is fabricated in thickness of 0.06 mm like Example 1. In piles, by the heat pressing method, laminate molding was carried out at 180 ** to both sides of the polyethylene terephthalate film (38 micrometers in thickness) which carried out the anchor coat of the prepared polyurethane resin beforehand, and the reverse face protective sheet for solar cells was obtained to them. The same evaluation test as Example 1 was done using this sheet, and that result was shown in Table 1.

[0036][Example 5] Using the same sheet as Example 1, from one side [further], 30Mrad exposure of the electron beam was carried out by accelerating voltage 150kv, and the bridge was constructed over 44% of the gel fraction. The reverse face protective sheet for solar cells which made the non-irradiation surface the inner layer was obtained. Using this sheet, the same evaluation as Example 1 was performed, and that result was shown in Table 1.

[0037][Comparative example 1] Polyethylene resin (density 0.923 (g/cm^3) and the melt flow rate 0.3 (g / 10 minutes) were fabricated in thickness of 0.20 mm from the cap (temperature of 200 **) using the extrusion machine, and the reverse face protective sheet for solar cells was obtained.) The same evaluation as Example 1 was performed using this sheet, and that result was shown in Table 1.

[0038][Comparative example 2] Using the aluminum fluoride composite sheet (0.08 mm in thickness) constituted from a fluoridation vinyl sheet on both sides of aluminium foil, the same evaluation as Example 1 was performed, and the result was shown in Table 1.

[0039]

[Table 1]

表1

	耐候性	防湿性	耐熱性	価格	総合評価
実施例1	○	○	○	◎	○
実施例2	◎	◎	○～◎	◎	◎
実施例3	◎	◎	○～◎	◎	◎
実施例4	○	○	◎	○	○
実施例5	○	○	◎	○	○
比較例1	○	×	×	◎	×
比較例2	◎	◎	◎	×	△

[0040]About Example 1 thru/or Example 5 which is a reverse face protective sheet for solar cells of this invention, Table 1 shows excelling also about which evaluation criteria. On the other hand, it turns out that it is inferior to dampproofing and heat resistance about the comparative example 1 which uses too low-density polyethylene resin, and inferior in respect of a price in the comparative example 2 which uses the conventional aluminum fluoride composite sheet.

[Translation done.]